2020-11-04 - Lecture 29

15.3 ***The New Iron Age*** **:: Metal and Glass Architecture**

1) ***ferrovitreous -*** literally means iron (ferro) and glass (vitreous)
2) ***Halle aux blés*** in Paris (hall of grain a.k.a. grain market)
   - The site formerly had the ***Hôtel Soissons*** on it, the fancy French Hôtel home of Catherine de'Medici. At her home, she had built an astrological viewing tower in 1575. The house was torn down but the tower remained and is still there.
   - Masonry circular (doughnut-shaped) building was built 1767
   - A wooden and glass dome was added to the masonry building in 1783 by ***Legrand & Molinos***
     - ***The wooden dome is the dome that Thomas Jefferson greatly admired***
     - **This dome burned in 1802**
   - A new cast iron dome was added by ***Francois-Joseph Belanger*** (1744-1818)
     - New iron dome chosen 1807, completed **1811**
     - Covered with copper sheets until 1838 when copper was replaced by glass
     - The building was razed (dismantled) in the 1870s

3) ***The NEW building type Gallerie or Passage***
   - The Gallerie or Passage represents the use of **iron and glass** to span a traditional urban space in the form of a corridor or avenue or alley space (linear), to create an indoor-outdoor commercial or consumerist urban experience with natural lighting
   - ***Passage du Caire*** in **Paris** (**1798**)
     - Building with Egyptian detailing based on interest in Napoleon's recent conquest of Egypt
     - Long, linear **Passage du Caire** was spanned with a simple iron and glass roof
   - ***Gallerie Vivienne*** *in* ***Paris*** (**1823**)
     - **Francois-Jean *Delannoy*** Architect
     - An elegant arcade of storefronts using classical motifs, pilasters, arched windows, and so forth, and then roofed with an elegant iron and glass roof allowing this public space to be filled with natural light
   - ***Gallerie St. Hubert*** *in* ***Brussels*** (**1836**)
     - **Jean-Pierre Cluysenaer** Architect
     - Similar to Gallerie Vivienne but much larger and higher
   - ***Galleria Vittorio Emmanuelle*** *in* ***Milan*** (**1863**)
     - **Giuseppe Mengoni** Architect (1829-1877)
     - A gigantic urban space roofed with iron and glass with a dome at the crossing of long barrel-vaulted arcades going in four directions.
     - Four-stories high
     - Elegant, upscale neoclassical storefronts with all the classical motifs

3) ***The NEW building type Department Store*** replaces *Gallerie* building type
   - **Au Bon Marché** in **Paris** (**1867**)
   - Architect: **Louis-Charles Boileau**, Engineer: **Gustave Eiffel** (1832-1923)
   - A complete shopping experience under one roof. Tall four-story grand stairs with iron and glass roofs above

4) ***The NEW building type Conservatory***. Can also be known as a: palm house, orchid house, hot house, greenhouse, orangery — basically an iron and glass structure that lets in light, contains heat and moisture, is vented to a certain degree, and allows plants to be grown in colder environments all year long.

   - ***Syon House Conservatory*** west of **London** (**1827**). Architect: **Charles Fowler**. Syon House interiors designed by Robert Adam in 1760 inside of an ancient pre-existing manor home or castle.
   - ***Palm House*** *at* ***Bretton Hall*** (**1827**). Architect: **John Claudius Loudon** (1783-1843) Bretton Hall is near Leeds, England
   - ***Great Conservatory at Chatsworth*** (**1836**) Architect and Gardener: **Joseph Paxton** (1803-1865)
     - This glass structure was the largest of its kind in the world at the time. The chevron-shaped walls did this: (1) structurally stronger (2) let in morning and evening light (3) resisted noonday sun
   - **Palm House** at **Kew Gardens** (**1844**). Architect: **Decimus Burton** (1800-1881)

- **Lily House** at **Chatsworth** (**1849**) **Joseph Paxton** to house *Victoria Amazonia,* a rare water lily. Vertical walls.

5) ***The NEW building type World Exposition Building — The Great Exhibition of 1851***
(essentially a World's Fair of arts and industry)
- ***Crystal Palace*** by **Joseph Paxton** (**1851**)
  - Gigantic glass building larger than the Palace of Versailles and 3X larger than St. Paul's Cathedral
  - A cathedral-like exhibition space that was gas-lit at night
  - Based on the iron and glass technology developed by Paxton on his previous conservatories

6) ***The NEW building type the Train Station*** — *Another new building type due to new materials and methods*
- **The Train Station became the *new propylaea or gateway to the city***, *but it moved from the city walls (or perimeter) to the city center!*
- Trains invented about **1825** as we know them today, that is a steam engine pulling wagons or carriages on a set of rails. This one was the Stockton & Darlington Line.
- ***George Stephenson*** Chief Engineer **Liverpool & Manchester Railway** (1781-1848)
- ***George Stephenson*** established the standard RR gauge of 4' - 8.5"
- ***Cut and Fill engineering of roadbeds***. Cut = Fill is the ideal situation. Then no fill has to be brought to site and no cut has to be removed from site.
- **Crown Street Station**, Liverpool (outskirts of town) **1831**
- **Lime Street Station**, Liverpool (center of town) (**1836**) soon replaced Crown
- ***Program developed for Train Station*** = Ticket Office and Waiting Room // Train Platform // Train Shed. Very soon most stations had clock towers.
- ***Euston Station***, **London** (**1837**) Birmingham & London Line. Architect: **Philip Hardwick** (1792-1870) Engineer: **William Cubitt**. Entry piece very much like a Greek Propylaea
- ***King's Cross Station***, **London** (**1851**) Eng: **Lewis Cubitt**. An early example of train sheds being architecturally expressed on the facade.
- ***Gare du Nord***, **Paris** (**1864**) Arch: **Jacques-Ignace Hittorff** (1792-1867) A monumental gateway in the middle of Paris, elaborately neoclassical with large arched openings, sculpture, etc, setting up a **classical expression of a new building type**. Sheds do not match facade.
- ***St. Pancras***, **London** (**1868**) Architect: **George Gilbert Scott** Engineer: **William Henry Barlow**. Fancy High Victorian Gothic hotel as the entry piece, which was not an expression of the train sheds but rather a grand urban gesture. Adding a hotel to a railway station made sense as connective tissue from the gateway of the train and the urban center itself.

7) ***Bridges and pure structure*** (such as the **Eiffel Tower**)
- ***Saltash Bridge*** connecting Devon with Cornwall over the Tamar River near Plymouth (**1859**)
  - Chief Engineer designer: ***I. K. Brunel*** (Isambard Kingdom Brunel)
  - Lenticular (lens-like) Trusses simply supported on masonry piers which suspended a single railway track roadbed
- ***Maria Pia Viaduct*** in **Portugal** by ***Gustave Eiffel*** (**1877**)
- ***Eiffel Tower*** in **Paris** (**1889**) Built for the ***International Exposition 1889*** tallest structure in the world at the time. **Gustave Eiffel** (**1832-1923**) (goo stav ee fell)
- ***Forth Bridge*** *in* ***Scotland*** crossing the ***Firth of Forth*** (**1883**). A cantilever bridge for a railway about 8000 feet long double railway. Near Edinburgh. Engineers: **John Fowler** and **Benjamin Baker**. Made of steel (not iron). Each upper arm is in tension, and each lower arm is in compression (see photo showing engineers **Fowler** and **Baker** holding up Japanese engineer **Watanabe** using cantilever principle.)
- ***Brooklyn Bridge*** in **NYC** connecting Manhattan with Brooklyn (**1869-1883**) Designed by ***John Roebling***. **Roebling Wire Rope Factory** in Trenton NJ. Steel wire cables: cable-stayed suspension bridge about 6000 feet long.
  - **Brooklyn Bridge became a icon of engineering as well as American culture**
  - Roebling died of tetanus in 1869. Son **Washington Roebling** takes over but he gets decompression sickness, so his wife **Emily Roebling** ends up taking over as

project manager. Brooklyn Bridge completed 1883